



Ruby 0-4-0T Kit

Assembly Instructions



Ruby Parts List

PART NO .& NAME	QTY	PART NO .& NAME	QTY
SHEET 1			
1 Frame	2	43 Cylinder	2
2 Bracket	4	44 Reversing Rod	1
3 M2 x 4 Hex Head Screw	25	45 Gasket	2
4 Wheelset (without eccentrics)	1	46 M2 x 6 Hex Head Screw	6
5 Wheelset (with eccentrics)	1	47 Valve Assembly	1
6 End Beam	2	48 M2 x 14 Countersunk Screw	8
7 D2.2 Washer	4	49 Saddle Extension	2
8 M2 x 10 Hex Head Screw	4	50 Saddle Block	2
9 Rear Frame Spacer	1	51 Saddle Plate	1
10 Deck Plate	1	52 Smokestack Nut	1
11 Middle Frame Spacer	1	53 Smokestack Washer	1
12 Lower Boiler Mounting Plate	1	54 Smokestack	1
13 Rear Boiler Saddle	2	55 Exhaust Pipe	1
14 Upper Boiler Mounting Plate	1	SHEET 4 - Boiler Assembly	
15 M2 x 8 Hex Head Screw	4	SHEET 5	
16 Front Boiler Saddle	1	61 Side-tank Support Bar	2
17 Front Frame Spacer	1	62 Right Side Tank	1
SHEET 2 - Chassis Assembly		63 Coupling Pin	2
SHEET 3		64 Sand Dome	1
21 Filler Plug	1	65 Steam Dome	1
22 Safety Valve	1	66 Steam Dome Base	1
23 Boiler	1	67 Left Side Tank	1
25 Burner	1	68 Cab Roof	1
26 Jet Assembly	1	69 Left Cab Wall	1
27 Lubricator Assembly	1	70 Front Cab Wall	1
28 Gas Tank	1	71 Right Cab Wall	1
29 Cap Nut	2	72 M2 x 3 Hex Head Screw	22
31 M3 x 5 Screw	2	73 M1.6 x 4 Hex Head Screw	4
32 Rocker Arm Assembly	2	Tools required (not supplied)	
33 M3 x 3 Set Screw	8	Small needle-nose pliers	
34 Drive Rod	2	Small phillips screwdriver	
35 Spacer	2	Small adjustable wrench	
36 Main Rod Assembly	2	Small round file	
37 Large E-clip	4		
38 M2 Nut	6		
39 Reversing Quadrant Assembly	1		
40 M2 x 4 Screw	2		
41 Valve Rod	2		
42 Small E-clip	4		

Introduction

The Locomotive

The Accucraft *Ruby* is a freelance, gauge 1, 1:20.3 scale, live-steam locomotive based on Baldwin practice. It has been designed to be both simple to operate and sophisticated enough to satisfy more experienced modelers. With proper care, your *Ruby* should give years of service in the garden.

Operating a live-steam locomotive is much different from running an electrically powered engine. It is a more hands-on, interactive experience. The locomotive must be periodically fueled, oiled, and watered. As supplied, *Ruby* is manually controlled, which means that you must actually drive the locomotive using the controls in the cab, just as you would a full-size engine.

The performance of the engine is also unlike electric locomotives. *Ruby* should pull up to half a dozen standard size freight cars on good, level track, which is about the capacity of a full-size locomotive of this configuration. Grades and sharp curves will diminish its capability. A good engineer will learn the engine's characteristics and idiosyncrasies over time to get the best performance and longest duration from it.

The Kit

This pre-painted kit can be assembled with a minimum of tools in just a few hours. Follow the instructions carefully and you should have no trouble.

Refer to your parts list and check that you received all the parts necessary to assemble the engine. Each part or group of parts is packed in its own plastic bag. Familiarize yourself with the parts but leave them in their respective bags until you are ready to use them.

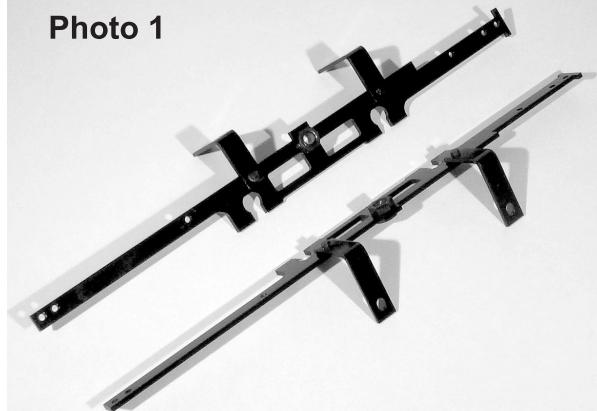
Follow the instructions sequentially, referring to the drawings as you go for clarification. Make sure you understand each step before proceeding. The part number is in parenthesis after each part name.

Chassis

Refer to sheet 1

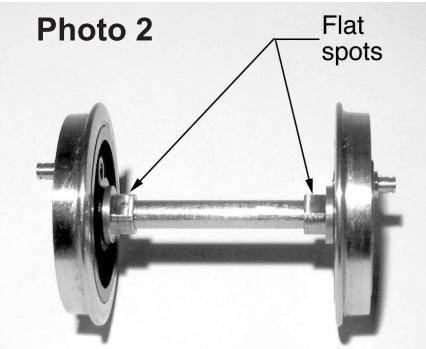
1-1. Start with the frames (1). Although they have the same part number, there is a left frame and a right. Identify the front end (the end with the most holes). The insides of the frames have the thicker nut about halfway along their length. Screw the brackets (2) to the inside of the frames with the M2 x 4 screws (3), as per the drawing and photo 1. Make sure the brackets are facing the right way.

Photo 1



1-2. Locate the wheelsets (4, 5), the front frame spacer (17), and the rear frame spacer (9). The front wheelset has the plain axle and the rear contains the eccentrics.

Photo 2



There is a bronze bushing next to the each wheel on each axle. This bushing has a flat side on it (photo 2). This flat side must face up to engage the flat in the hole on the frame.

Starting with the rear axle, slip the axle hole in the frame over the axle, next to the bushing, then slide the bushing into the hole, making sure the flat side

is up. The frame should slide over the bushing without too much pressure. Don't force it or you risk bending the frame. Once this has been accomplished, do the same with the front axle. Your assembly should now look like photo 3.



Photo 3

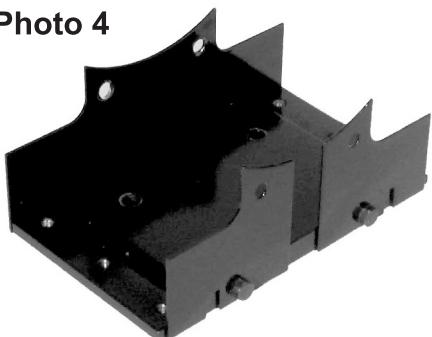
Screw the front and rear frame spacers between the frames with M2 x 4 screws (3), as per the drawing. Then screw the middle frame spacer (11) into position behind the rear drivers with M2 x 4 screws. The chassis should roll smoothly at this point.

Screw the end beams (6) to the frame spacers at both ends, using M2 x 10 screws (8) with D2.2 washers (7). Screw the deck plate (10) to the frames with four M2 x 3 screws (72).

1-3. Screw the lower boiler mounting plate (12) to the frames with four M2 x 4 screws (3), sliding the plate between the frames with the flanges downward, as per the drawing. Make sure the four holes on top are toward the rear of the engine.

Screw the two rear boiler saddle pieces (13) to the rear of the edge of the upper boiler mounting plate (14) with M2 x 3 screws (72), paying close attention

Photo 4



to the drawing. Then screw the front boiler saddle pieces (16) to the upper boiler mounting plate with M2 x 3 screws (72). The assembly should look like photo 4.

1-4. Screw the assembly to the frames with four M2 x 8 screws (15). You may have to loosen the rear boiler saddle pieces so that the notches in them fit over the frames and the holes in the upper boiler mounting plate align properly with those below. At this point, your chassis should look like the drawing on sheet 2.

3-1. Find the cylinders (43), the gaskets (45) and the valve assembly (47). Screw the cylinders to the upper boiler mounting plate with three M2 x 6 screws (46) each.

3-2. Slip the side rods (34) over the crankpins on the wheels. With a small pair of needle-nose pliers, carefully snap an e-clip (37) into the groove on each of the front drivers' crankpins to retain the side rod.

Now, working on one side at a time, slip the spacer (35) over the rear crankpin, followed by the main rod assembly (36). When installing the main rod assembly, note that the crosshead (the small, black piece on the end) has a small, threaded hole on one side with a set screw installed. This hole must be in the "down" position when the rod is installed. Retain the rod on the crankpin with an e-clip as you did the side rods.

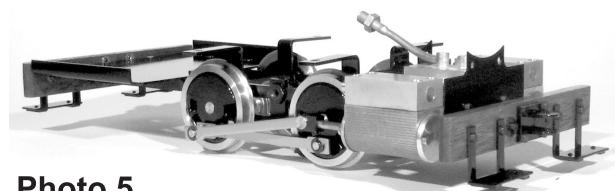


Photo 5

3-3. The main rods can now be connected to the piston rods in the cylinders (43). Pull the piston rods out a little (they may be stiff) and examine them. You will see a dimple machined into the side of the

rod end. The set screw that is installed in the main rod must seat in that dimple to hold the piston rod in place. Carefully remove the set screw.

With your fingers, rotate the piston rod so the dimple is facing downward. Align the large hole in the crosshead with the end of the piston rod and rotate the wheels, bringing the crosshead into contact with the piston rod. The piston should slide into the crosshead. Push it in all the way. Looking at it from the bottom, you should be able to look through the threaded hole and see that it is aligned with the dimple. When this looks good, screw in the set screw. Now, when the wheels are rotated, the piston rods should move in and out of the cylinders.

3-4. Place the two sheets of gasket (45) on top of each cylinder, aligning the holes, as per the drawing. The gaskets should be very oily. If they are not, put some lightweight machine oil on them. This will help them seal better. Then place the valve assembly (47) on top of the cylinders, sandwiching the gaskets in between. Screw the valve assembly tightly to the cylinders with eight M2 x 14 screws (48). The chassis should look like photo 5 at this point.

3-5. Screw an M2 nut (38) onto the long end of the reversing rod (44). With your fingers, carefully remove the reversing valve from the valve assembly. This is the one in the middle. Screw the short end of the reversing rod all the way into the threaded hole in the reversing lever on the reversing quadrant (39), then back it off a half turn or so. See photo 6. You may optionally add an M2 nut (38) to hold the rod in the quadrant lever.

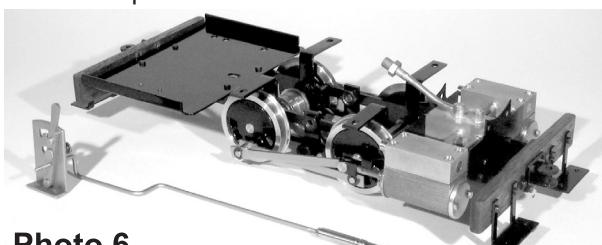


Photo 6

3-6. Screw the reversing quadrant (39) to the deck plate with two M2 x 4 screws (3), as per the drawing. If the screw holes in the deck plate have paint in them, the screws may not go in easily. If this is the case, clean the holes out by running a screw into them by itself. Take it slowly so that you don't run the risk of twisting off the head of the screw. (If the screw won't start from the top side, try it from underneath.)

Adjusting the reversing valve. On the reversing valve itself is a very fine groove approximately 3/8" from the rear end. This is an adjusting aid. When the reversing quadrant is in the forward position, the groove should just be touching the valve block. If it isn't, the valve can be adjusted in two ways. 1) The screws holding the reversing quadrant can be loosened and quadrant slid in one direction or the other to achieve the adjustment. 2) If this doesn't work, the valve itself can be screwed or unscrewed along the reversing rod until properly adjusted. When proper adjustment has been attained, secure the valve to the rod with the nut.

3-7. Take a rocker-arm assembly (32) and slide it through the hole in the frame from the outside and into the rocker arm attached to the eccentric rod. The arm inside the frames should point down and the one outside, up. Fasten them together with a set screw (33) through the hole in the inside rocker arm. The set screw should engage the flat space on the shaft. There should be a slight amount of free play in the shaft so that it can move freely. Repeat on the other side. See photo 7.

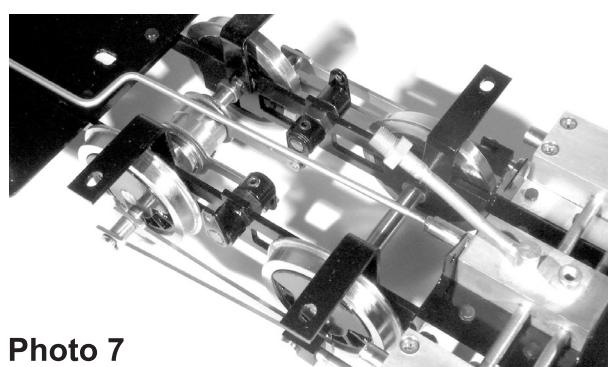


Photo 7

3-8. On the short leg of each valve rod (41) are two small grooves. Snap an e-clip (42) onto each inner groove. Carefully remove each valve from the valve blocks and screw them onto the ends of the valve rods (photo 8). Do not tighten the nut against the valve at this point, as the valves will have to be adjusted later.



Photo 8

Put a little oil on each valve and carefully return it to its place in the valve block. Insert the other end of each valve rod through its respective hole in each rocker arm and secure it with an e-clip (42) in the outer groove.

3-9. The eccentrics are the brass discs on the rear axle. Each has two threaded holes in it with set screws installed. Loosen the set screws but do not remove. Slightly tighten one set screw in each eccentric, just enough so that when the wheel is rotated, the eccentric revolves with the axle.

Adjusting the Valve Travel

As with the reversing valve, each of the cylinder valves has a tiny groove machined into it. In the valve's forward-most position, that groove should be just touching the valve back.

Taking one side at a time, rotate the drivers and observe the valve's travels. If the tiny groove travels inside the valve block, screw the valve farther onto the valve rod. This can be done with the valve in place – no need to disassemble anything. If the groove never reaches the block, screw the valve in the other direction. When the groove finally touches the block in the valve's forward-most position, secure the valve on the rod by carefully tightening the nut against it, making sure that the valve doesn't rotate while you are doing so.

Setting the valves

Loosen all of the screws in the eccentrics so that the eccentrics rotate freely on the axle. Working with the chassis upside down, rotate the wheels so that the right-hand side is at rear dead center (i.e. the piston rod is out as far as it will go – see figure 1). Without rotating the axle, rotate the right-hand eccentric so that the two holes are equidistant on either side of the axle when looking straight down on it. Tighten one screw.

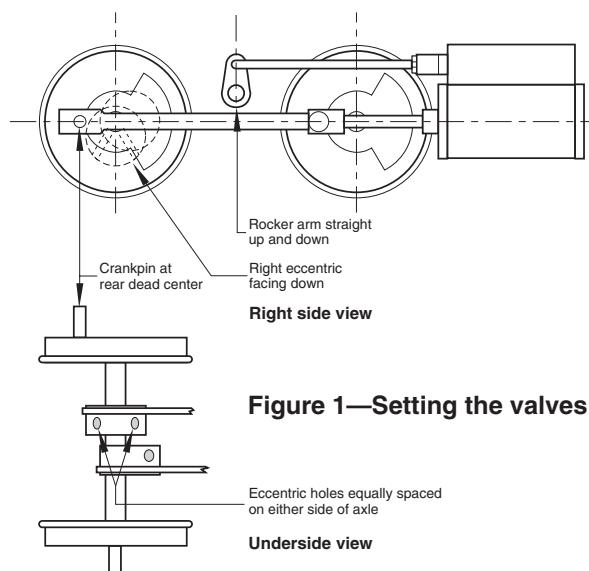


Figure 1—Setting the valves

Now follow the same procedure for the other side. If your work was done correctly, the valves should now be set and you should have a working chassis. The finished chassis can be seen in photo 9.

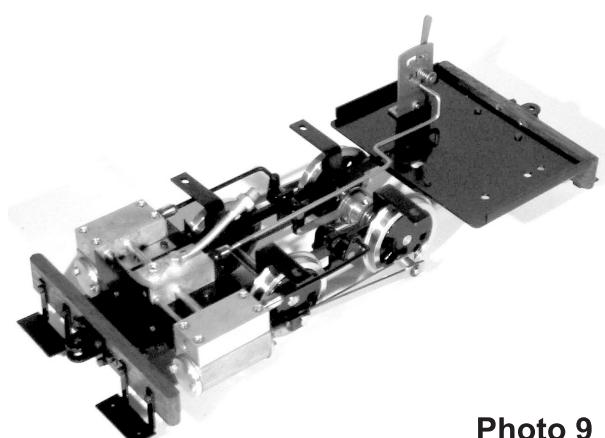


Photo 9

Testing the Chassis

The chassis should be tested on compressed air. This could be from an air compressor or even a bicycle pump. You will have to arrange a temporary connection between the air supply and the inlet pipe. Alternatively, you can temporarily install the exhaust pipe (55) and apply the air there. If you do it this way, the engine will run backward from normal (i.e. reverse when the lever is in forward gear). First, oil all moving parts with lightweight machine oil. Try running the chassis on about 20 psi air pressure. The mechanism may be somewhat stiff at this point and require a little more. Put the reversing lever in forward gear (pull the handle away from the quadrant to move it), then apply the air. If everything is well, the engine will run strongly and smoothly in both directions.

The engine may run better in one direction than the other. If this happens, double check the valve settings on both sides (both timing and adjustment). Through a process of trial and error, making one adjust at a time, you should eventually get the chassis to perform well and equally in both directions. If things get completely out of hand, readjust and reset the valves according to the directions and start again.

Boiler

3-10. Screw the safety valve (22) and the filler plug (21) into the boiler (23) finger tight , as per the drawing. The throttle assembly features a blank hex head plug on the right side that can be used to add an optional pressure gauge later. Set the boiler aside.

3-11. Put the saddle blocks (50) in position above the valve block assembly and screw them in place with four M2 x 3 screws (72), as shown in the drawing. (A) (B) (C) (D) show where the screws attach to the saddle blocks. If the steam-admission line is bent upward, gently bend it down so that it is level

or a little below. Screw the two saddle extension pieces (49) to the sides of the saddle blocks with two M2 x3 screws (72) each, as per the drawing.

3-12. Screw the saddle plate (51) to the bottom of the smokebox with four M2 x 4 screws (3). In the event that the holes in the saddle plate do not match up precisely, you may have to open them out a bit with a small round file.

3-13. The lubricator (27) must be mounted on the deck plate. Before you can do that, though, you must form the steam line. Look at the drawing on sheet 3 and photo 10 for an idea of what it should look like. At this point, just worry about the longer line, the one that will be connected to the steam-admission line on the valve block. Gently work the soft copper with your fingers, carefully bending it to shape. Be careful not to crimp the tubing. Trial and error will see you through. Eventually the lubricator should sit flat on the deck and the end of the tube will mate with the admission line (photo 10). When this has been achieved, fasten the lubricator to the deck from underneath with a cap nut (29). Screw the union nut at the end of the steam line from the lubricator to the fitting on the steam-admission line. Hold the fitting with a wrench while tightening the union nut with another wrench. The chassis is now ready to receive the boiler.

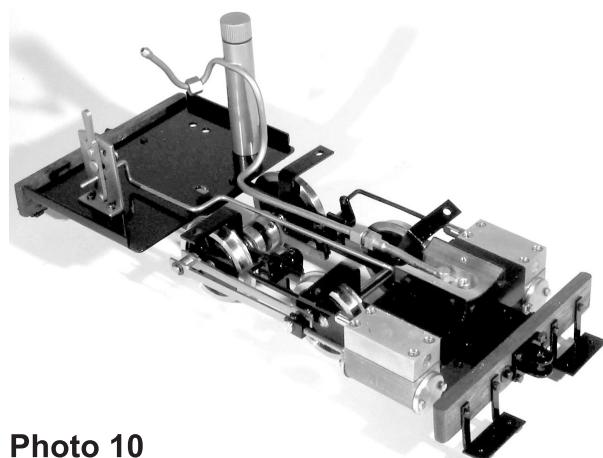


Photo 10

3-14. Place the boiler on the chassis. Screw an M3-5 phillips-head screw (31) through the deck and into the rear mounting stud from underneath. Do not tighten it too much yet.

Fasten the smokebox to the saddle with two M2 x 4 phillips-head screws (40) through the saddle plate, as per the drawing. This is most easily accomplished by inserting your screwdriver through the smokestack hole for access to the screws. The screws can be put in position with needle-nose pliers through the smokebox door.

Referring to the drawing, carefully bend the short leg of the steam pipe until it will smoothly mate with the thread on the throttle. The two must be well aligned for a steam-tight fit. Secure the union nut to the throttle.

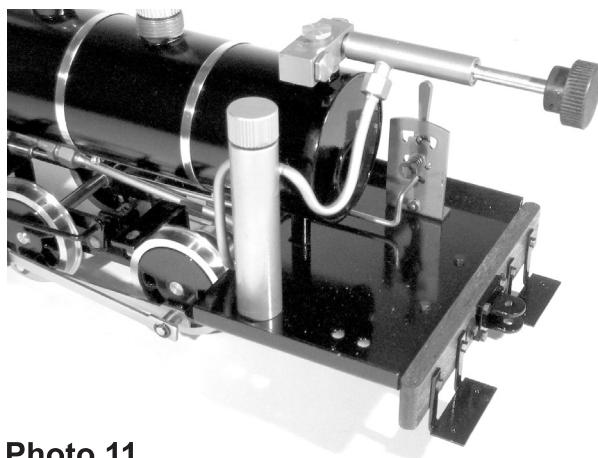


Photo 11

3-15. Place the smokestack washer (53) on the smokestack nut (52) with the flat side bearing against the nut. Open the smokebox door, insert the nut and washer from inside, making sure the curvature of the washer conforms to the curve of the smokebox, and screw the smokestack (54) partway on. Tighten the nut, making sure the curvature of the bottom of the stack conforms to the smokebox. Secure the nut tightly with pliers.

Drop the exhaust pipe (55) down the stack and screw it into the valve-block. It need only be finger tight.

3-16. Slip the burner (25) into the flue opening in the back of the boiler and secure it with an M2 x 4 screw (3). Secure the gas tank (28) to the deck with one cap nut (29). Slide the jet (26) into the back of the burner. Carefully and gently bend the copper gas line until the threaded part of the gas valve lines up well with the end of the gas line (photo 11). Tighten the union nut to the gas valve.

At this point you should have a working locomotive. Ruby was designed so that the cosmetic components (cab and tanks) could be easily modified. The boiler and chassis comprise the working portion of the engine. If you'd like, you can try it under steam now, or you can wait until the tanks, cab and domes have been applied.

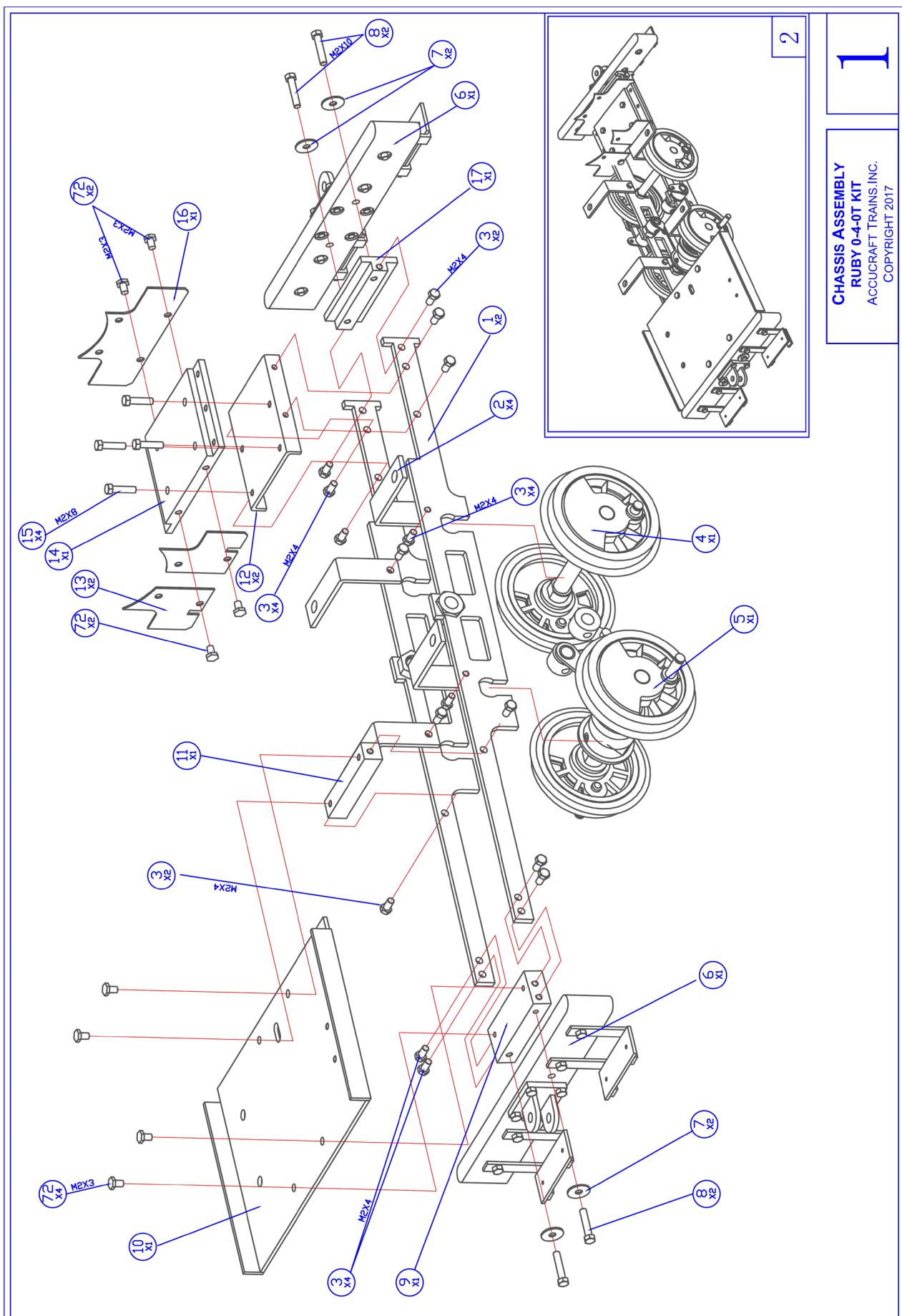
Refer to Sheet 5

5-1. Take the steam dome base (66) and place it over the safety valve. The steam dome (65) screws to the safety-valve bushing, securing the base. The sand dome (64) merely slips over the filler plug and is held in place by gravity. Be sure to remove it before turning the engine upside down.

5-2. Lay the side tank support bars (61) across the brackets, beneath the boiler. Take the right-hand tank (62) and place it on the bars. Holding everything in place, carefully turn the engine over and fasten the tank with two M3 x 5 screws (31). Repeat with the left tank (67).

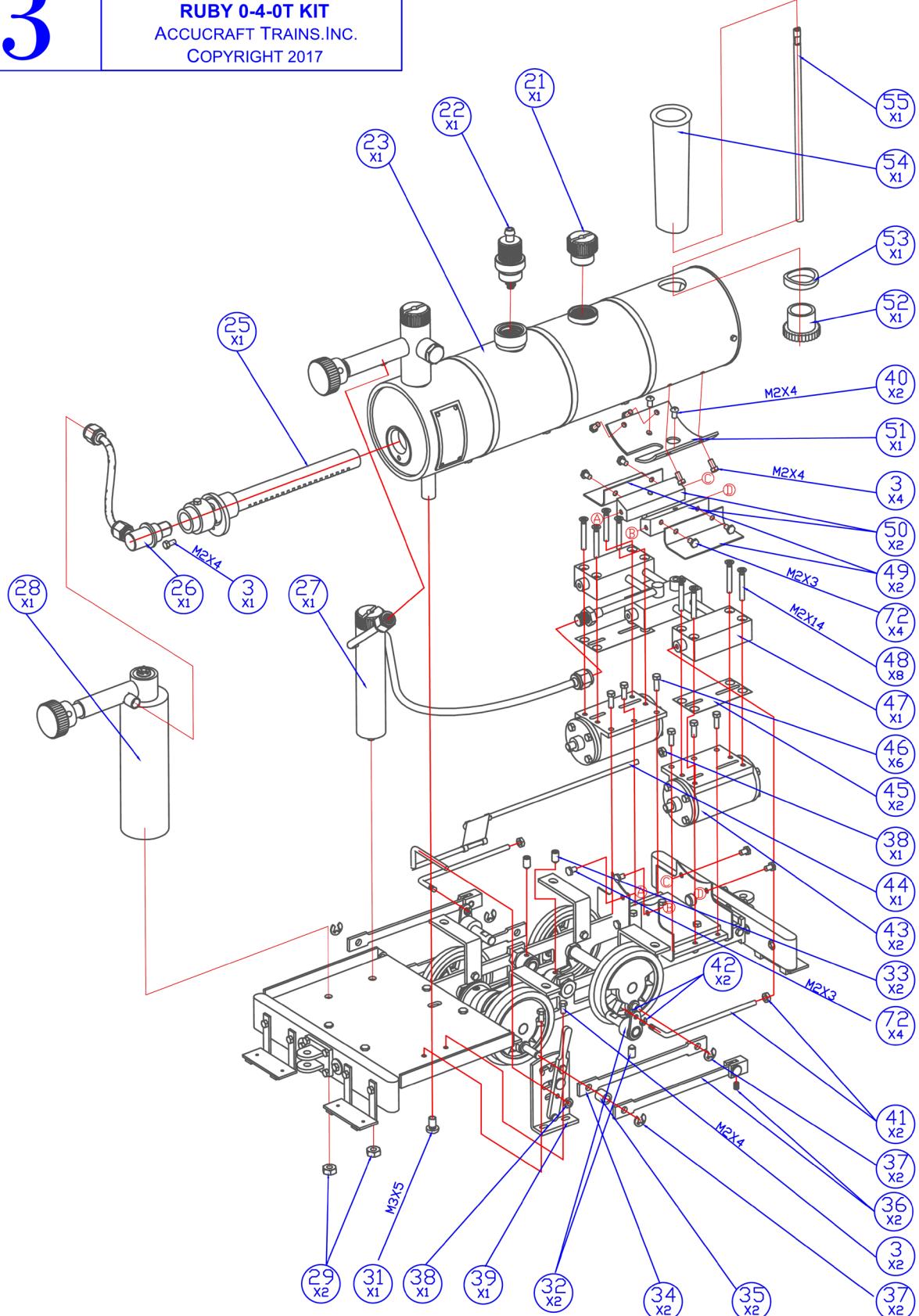
5-3. Screw the cab sides (69, 71) to the cab front as per the drawing, with M2 x 3 screws (72). Then attach the roof with four M1.6 x 4 screws (73). Recommend attaching the front two screws first and then the rear two screws. The cab should slide easily over the boiler. If it does not, file the inner edges of the cutout around the boiler until it does.

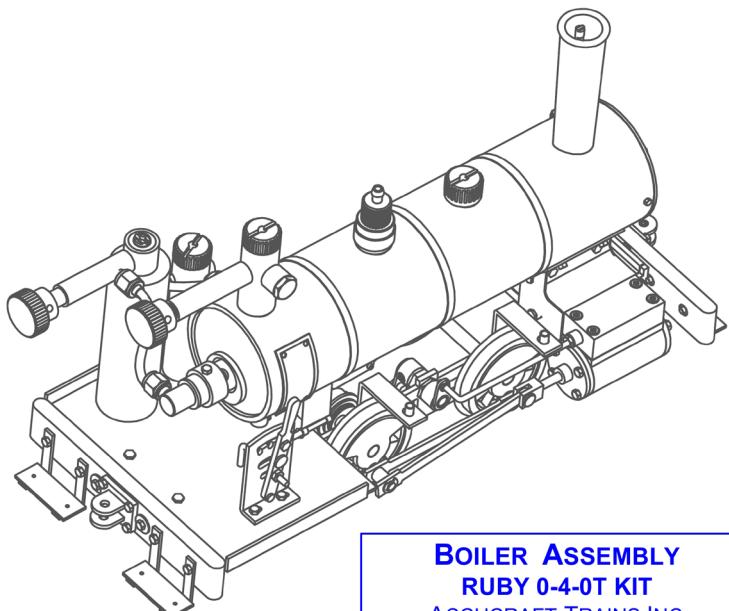
That completes the Ruby kit. Now go outside and enjoy many years of steaming.



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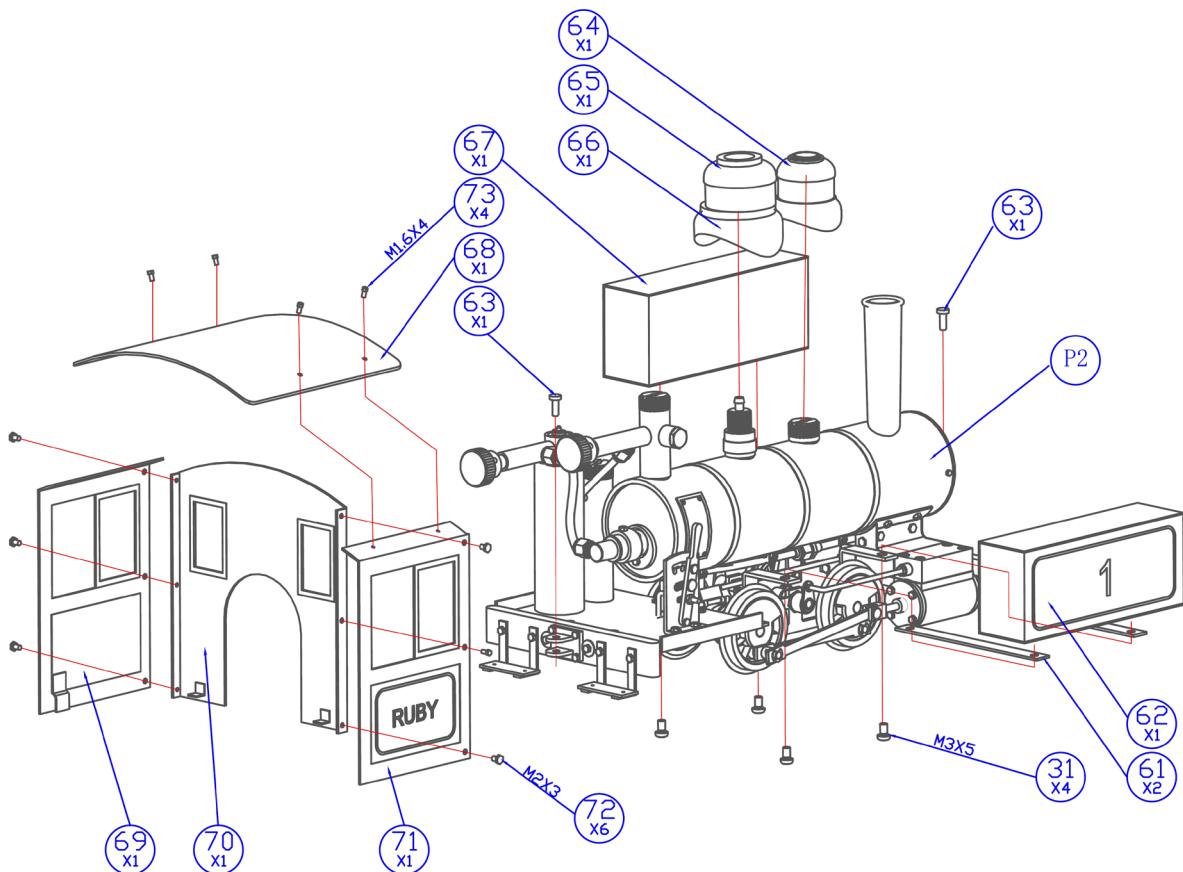
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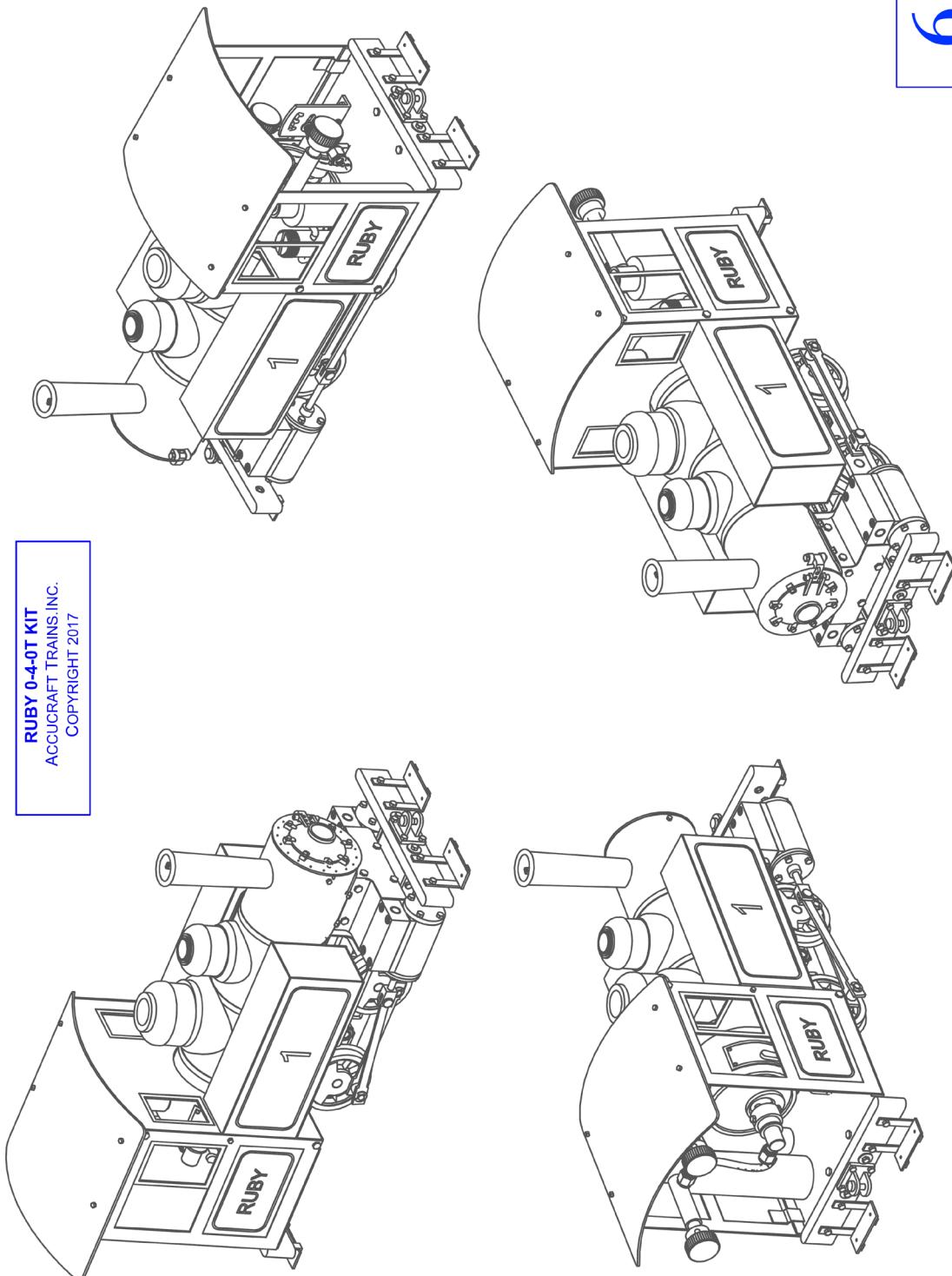
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33268 Central Ave Union City, CA 94587, USA

TEL: 1-510-324-3399 FAX: 1-510-324-3366

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